Epitomes

Important Advances in Clinical Medicine

Emergency Medicine

The Scientific Board of the California Medical Association presents the following inventory of items of progress in emergency medicine. Each item, in the judgment of a panel of knowledgeable physicians, has recently become reasonably firmly established, both as to scientific fact and important clinical significance. The items are presented in simple epitome and an authoritative reference, both to the item itself and to the subject as a whole, is generally given for those who may be unfamiliar with a particular item. The purpose is to assist busy practitioners, students, research workers or scholars to stay abreast of these items of progress in emergency medicine that have recently achieved a substantial degree of authoritative acceptance, whether in their own field of special interest or another.

The items of progress listed below were selected by the Advisory Panel to the Section on Emergency Medicine of the California Medical Association and the summaries were prepared under its direction.

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Intraosseous Infusion for Emergency Vascular Access

ESTABLISHING INTRAVENOUS (IV) access in the resuscitation of an ill child is notoriously difficult. Peripheral veins may be collapsed, and often resuscitation is delayed while central intravenous access and vascular cutdowns are attempted. In contrast, intraosseous access is rapidly achieved and simple to do.

Intraosseous infusion of fluids and drugs has been described since the 1920s, and much laboratory and clinical investigation of its use was reported in the 1940s. In the 1950s, however, with the development of improved, disposable IV needles, intraosseous infusion was neglected. Only in the past few years has this technique been reevaluated as an alternative for intravascular access in a critically ill child.

Most authors recommend intraosseous entry on the anteromedial surface of the tibia 1 to 3 cm below the tibial tuberosity. Alternatively, the femur or distal tibia can be punctured. Needles with stylets, such as spinal or bone marrow needles, are preferred, but 18- or 20-gauge hypodermic needles may be used. Steady pressure or a screwing motion is used to traverse the bony cortex. Needle placement in the bone marrow is confirmed by a decrease in resistance during insertion, the ability to aspirate marrow and the free inflow of fluid. IV tubing is connected to the needle and drugs and fluids infused as needed.

Extensive marrow sinusoids empty into large medullary venous channels, which in turn drain into nutrient and emissary veins and return to the systemic circulation. Various studies in the 1940s have shown rapid entry of dyes, fluids and drugs from the bone marrow into the central circulation when the circulatory system is intact. More recent studies have shown the efficacy of this route during fibrillatory cardiac arrest in swine and hypotensive hemorrhage in calves. Any drug or fluid normally administered intravenously can be used intraosseously at comparable doses.

Complications are rare and include hematoma, subcutaneous infiltration and leakage from multiple puncture sites. Osteomyelitis has been described only with the infusion of hypertonic solutions or with long-term use of the intraosseous route. Fat or bone embolus has not been reported. Histologic and radiographic follow-up of involved bone does not show significant abnormality.

Intraosseous infusion is a safe, easy and reliable method of vascular access in an emergency situation.

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Sodium Bicarbonate Therapy in Cardiac Arrest

TRADITIONAL MEDICAL THERAPY for patients with cardiac arrest has included the use of sodium bicarbonate to reverse arterial acidosis. Previously, early administration of bicarbonate in the algorithms of advanced cardiac life support (ACLS) courses has led to its widespread use during resuscitation efforts. This occurred despite warnings in the textbook describing adverse effects of the use of bicarbonate.

In recent years mounting evidence has made these concerns more prominent. A closer study of blood chemistry has shown that arterial blood determinations fail to adequately reflect severe respiratory acidosis on the venous side. Moreover, a direct correlation between extracellular and intracellular pH does not exist. Several animal models have shown poorer results with bicarbonate infusion for lactic acidosis than with infusing saline solution alone.

Several mechanisms account for these observations. Infusing bicarbonate generates carbon dioxide (CO_2). With inadequate ventilation or excessive bicarbonate infusion, CO_2 levels rise rapidly, creating a respiratory acidosis. CO_2 rapidly diffuses across the cell membranes to cause intracellular acidosis. Myocardial function becomes depressed